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ABSTRACT

This study analyzed Indiana teachers' knowledge and attitudes about environmental problems and their solutions. A total of 67 elementary and secondary teachers from urban and rural schools were surveyed. The measurement techniques included a list of 70 environmental terms, 25 multiple-choice statements on concepts, and semantic judgments of 12 environmental expressions. with the exception of science teachers, the study revealed that Indiana teachers possess inadequate environmental knowledge and awareness. This study suggests that statewide teacher training in environmental concepts and issues should be implemented to insure effective dissemination of environmental concepts and attitudes to students. (MR)

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Indiana State University

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SCHOOL OF EDUCATION

TERRE HAUTE, INDIANA

SE 020 011

Foreword

The School of Education of Indiana State University is proud to present under this cover the scholarly work of its professors. The search for truth and educational wisdom is truly one that involves all of us, and efforts such as these are testimonials to the strength and vigor of this search.

One of the marks of a true professional is a willingness to share the results of his work with others who are involved in this quest. The distribution of papers such as this is a confirmation of this professional ideal.

It is most important that the men and women engaged in the task of expanding the boundaries of scholarship in education understand that their efforts are understood and appreciated. This statement is a way of telling them that all of us are honored by their accomplishments.

David Turney, Dean

SCHOOL OF EDUCATION
INDIANA STATE UNIVERSITY
TERRE HAUTE, INDIANA 47809

THE STATUS OF INDIANA TEACHERS' ENVIRONMENTAL KNOWLEDGE AND ATTITUDES

Dr. Chris Buethe

Chairman and Professor of Secondary Education

Indiana State University

Terre Haute, Indiana

1975

Acknowledgements

A number of professional educators and environmentalists contributed to this study, conducted with the support of a Research Grant from Indiana State University.

Dr. Harold H. Negley, State Superintendent, Dr. Ray Maudlin, Director of Research, and Mr. Joe Wright, Environmental Education Consultant, aided the project through their cooperative branches of the Indiana State Department of Public Instruction.

Many test items were contributed or critiqued by Dr. James Lee Guernsey, Professor of Geography, Indiana State University; Dr. John Carter, Assistant Professor of Education, Southwest Missouri State University; and Dr. John Hernandez, Dean, School of Engineering, New Mexico State University.

Special thanks to Mr. Ed. Galluzzi, Graduate Assistant, Indiana State University, School of Education, for his self-directed efforts on behalf of the project.

- - - - Chris Buethe

Introduction

Many Indiana adults are ill informed or misinformed about environmental terms and concepts and the environmental problems of their state and home communities. A 1974 survey of 67 elementary and secondary teachers from urban and rural settings in Central and Southern Indiana indicated that of 61 common environmental terms, half or more of the teachers were unfamiliar with 25, including *aeration, biodegradable, cloud seeding, effluent, bituminous, fly ash,* and *SST*. Teachers were confused by or unfamiliar with 12 of 20 selected environmental concepts, including Indiana energy use rate and the principal sources of city air pollution. These teachers and their counterparts influence thousands of residents throughout Indiana.

Questions can be raised about the capability not only of Indiana elementary and secondary teachers, but of teachers nationwide, to deal effectively with environmental education. The problem becomes paramount given two key assumptions: (1) our teachers are at times environmental educators and (2) teachers teach mainly in terms of what they know and how they feel.

The present study investigated two basic questions: (1) What do Indiana teachers know about their physical environment? and (2) How do Indiana teachers feel about

their environment? The answers to these questions should provide a valid profile of Indiana teachers' environmental knowledge and awareness.

Method and Procedure

Four hundred ninety-three currently certified elementary and secondary teachers in the state of Indiana were randomly sampled by mail. Of these 493, a total of 271 (55%) responded and were included in the analyses of data. Respondents were asked to supply information on six personal and professional characteristics: age group, sex, marital status, teaching level, discipline taught, and school setting. Since not all teachers indicated each of the six characteristics, some different totals resulted for each characteristic. An analysis appears in Table 1.

Table 1

DISTRIBUTION OF TEACHERS BY CHARACTERISTICS

Elementary	132	Secondary	120		
Male	110	Female	149		
Married	177	Unmarried	43		
Urban	140	Rural	109		
Discipline:	Science 31	Social Studies	25	Other	129
Age: (20-29)	86	(30-39) 54	(40-49) 47	(50+)	46

Two scales were completed by the teachers sampled. The scales were developed over a six year period by Dr. Chris Buethe, professor of education at Indiana State University, based upon advice of ten environmental researchers. The first scale included two parts which measured the extent of their environmental knowledge. Scales Part A included a list of 70 environmental terms, for which the teachers indicated their present degree of understanding by selecting one of the following responses: (A) I know what the term means, (B) I recognize the term, but I don't know what it means, or (C) I have never heard of the term. For example, the term "energy"; energy is the capacity to do work. It is assumed that a teacher-respondent who was familiar with the meaning of *energy* marked "A" on the answer sheet, and that a teacher who marked either "B" or "C" did not know the meaning of that term. Response categories B and C were grouped together for the analysis of results of Part A: Environmental terms.

Part B included 25 multiple-choice statements dealing with knowledge of environmental problems and concepts. Teachers were asked to mark the choice that corresponded to the best answer in each case. For example, "The first one of these to decay when buried in the ground is a (an): (A) glass bottle, (B) "tin" can,

(C) aluminum can, or (D) plastic bottle. Since a "tin" can is the first one of these to decay when buried in the ground, the best answer is "B".

The second scale[1] (Part C) was designed to measure the feelings and attitudes of teachers toward the following environmental expressions: Agricultural Pesticide, Auto Weight Tax, Birth Control, Clean Environment, Electric Heating, Emission Control, Factory Effluent, Industrial Water Use, Nuclear Energy, Strip Mine, Technology, and Treated Sewage. Nine qualifier pairs were listed to help assess the semantic judgments of teachers toward each of the environmental expressions. Included were evaluative, potency, and activity qualifiers.

Seven steps were differentiated between bipolar qualifiers to assess the semantic judgments of teachers. The teachers were asked to check the step and the direction of the qualifier which most accurately described how they felt about each environmental expression; i.e., whether a term was extremely related, quite related, slightly related, or not related (neutral). Complete semantic data will be utilized by the Indiana State Department of Public Instruction at a later time.

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[1]Scale based in part on the model presented by Snider and Osgood in Semantic Differential Technique (Chicago, Illinois: Aldine Publishing Co., 1969).

For the purpose of this study, the bipolar qualifiers *wise-foolish* and *good-bad* were utilized. The environmental scales, a computer answer form, a self-addressed, prepaid return envelope, an optional post card to be completed if a summary of the major findings of this present survey was desired, and a cover letter were mailed to the teachers sampled. The cover letter originated under the auspices of Dr. Harold H. Negley, Superintendent of the Indiana State Department of Public Instruction. (See Appendix.) Each scale was coded upon return so that analyses could be performed.

Following a brief period, a duplicate packet of materials with a new cover letter was mailed to obtain more data. This letter incorporated each of the major points in the first letter, including the originally worded instructions.

Limitations of the Study

Most questions and vocabulary items making up the instruments used in the study were based upon work conducted previously by the investigator in New Mexico (1971) and in Indiana (1974) upon the advice of environmental experts from seven disciplines. The short single-form, non-standardized instruments used contain some questions that may lack curricular validity for specific

Indiana school and community settings. However, it is felt that attempts to update question content to common 1975 environmental issues compensate for the lack of standardization. A self check of vocabulary may yield inaccurate and possibly inflated results. Environmental literacy may be lower than indicated here.

A fifty-five percent response is judged to be adequate for the purpose of the study in view of the large sample, despite the fact that responses were made by teachers over a ten week period.

Value-oriented questions about the physical environment may have no absolutely "right" answers. Even environmental experts disagree on some proposed solutions to environmental problems. In an attempt to obtain useful responses to this study, many important and controversial questions about man's environment were omitted. This study yields a partial but useful information base about Indiana teachers' environmental knowledge and feelings.

Results

Part A: Environmental Vocabulary

Half of the 70 environmental terms were known by fewer than 90% of the teachers sampled. These terms were ranked from least to most known and appear in Table 2

TABLE 2

ENVIRONMENTAL TERMS RANKED
FROM LEAST TO MOST KNOWN

Term	Percentage knowing term's meaning
ERTS	5
particulate	28
fly ash	32
degasification	33
biosphere	34
scrubber	39
SST	42
effluent	48
precipitator	49
temperature inversion	49
hydrocarbon	50
leaching	53
greenhouse effect	53
EPA	53
ozone	60
sulfur dioxide	67
plankton	71
aeration	72
reclamation	72
biodegradable	75
fossil fuel	75
bituminous	76
herbicide	76
decibel	80
compost	81
runoff	81
watershed	81
water rights	82
food chain	83
enzyme	84
phosphate	86
cloud seeding	87
thermal	87
standard	88
leaded (gasoline)	88

Remainder of terms are known by 90% or more of the teachers.

In order to determine what differences there might be in the percentage of terms known by teachers possessing different characteristics (e.g., male-female), a general analysis was made.

TABLE 3

INDICATED KNOWLEDGE OF 70 ENVIRONMENTAL TERMS COMPARING INDIVIDUAL TEACHER CHARACTERISTICS

VARIABLE		NUMBER OF ENVIRONMENTAL TERMS KNOWN 0 to 17	18 to 35	36 to 53	54 to 70
SEX	MALE	1	9	16	74[a]
	FEMALE	7	13	13	67
MARITAL STATUS	MARRIED	1	14	11	73
	UNMARRIED	3	14	21	61
TEACHING LEVEL	ELEMENTARY	3	14	13	70
	SECONDARY	1	11	16	71
DISCIPLINE*	SCIENCE	1	0	9	90
	SOCIAL STUD.	3	9	16	73
	OTHER	3	16	11	70
LOCATION	URBAN	3	16	13	69
	RURAL	1	10	17	71
AGE	20-29	4	14	17	64
	30-39	1	13	17	69
	40-49	1	11	11	76
	50+	1	10	11	77

[a]Figures in the body of the table are rounded to the nearest percent. e.g. 74% of the male teachers responding knew 54 to 70 of the 70 environmental terms.

By Chi-square analysis, statistically significant differences appeared with respect to discipline. * = $p < 0.05$

Differences of responses within variables are evident, although in only one category are they statistically significant. As expected, science teachers do indicate a significantly higher level of recognition of environmental terms than do social studies or other teachers.

Although no statistically significant differences are evident when other variables are considered, it is observed that somewhat higher vocabulary scores are indicated by males than by females and married teachers record higher scores than unmarried. Also, scores increase slightly with each successively higher age group.

Results

Part B: Environmental Problems and Concepts

Twenty-three multiple-choice questions about environmental problems and concepts were utilized in obtaining mean scores and analyses of individual items. Returns from 259 teachers yielded mean scores of slightly less than 61% on the non-standardized part B scale.

Analysis of variance techniques indicated no statistically significant difference between scores by groups indicating elementary or secondary level, urban-rural location, marital status or age. On two categories, sex and teaching field, significantly higher scores were made by science teachers and by males. F ratios and other data appear in Table 4.

TABLE 4

ENVIRONMENTAL PROBLEMS AND CONCEPTS

Variable	Value	Mean	STD DEV	N	F
Teaching level	Elem.	13.8	2.99	132	0.55
	Sec.	14.1	3.93	120	
Location	Urban	13.8	3.46	140	0.24
	Rural	14.0	3.58	109	
Married	yes	13.9	3.33	177	0.25
	no	13.7	2.78	43	
Sex	male	14.8	3.15	110	12.7**
	female	13.3	3.40	149	
Teaching Field	Science	16.2	2.48	31	
	Social Stud.	13.4	4.08	25	7.76**
	Other	13.7	3.19	129	
Age	20-29	14.0	3.11	86	
	30-39	13.6	4.39	54	0.47
	40-49	13.7	2.95	47	
	50+	14.3	3.19	46	

**highly significant ($p < 0.01$)

ANOVA: Summaries by Variable

An analysis of individual items pointed out some differences of apparent familiarity with specific environmental problems. Table 5 rank orders response patterns from least known to most known answers. Neither comparability of questions nor standardization is implied.

While most teachers (96%) recognized that trees are a principal source of paper, many teachers are unfamiliar with other environmentally related questions.

TABLE 5

RANKING OF ENVIRONMENTAL PROBLEM RESPONSES

Environmental Concept Cue	Percentage of teachers who did *not* know
Rate of fossil fuel use (to factor of 5)	82%
1990 prime US energy source	77%
Garbage production rate	70%
Efficient auto speed	68%
Wabash watershed	57%
Water hardness cause	49%
Shale oil region	41%
Fireplace efficiency	40%
Sun as energy source	39%
Air pollution reduction	38%
Noise-induced deafness	34%
Food chain	31%
Ecology defined	31%
Rate of home water use (to factor of 10)	27%
Degradable solid waste	26%
Electrical use peaks	24%
Coal fuel reserves	23%
Weeds and herbicides	22%
Mercury lake pollution	22%
Indiana electricity sources	21%
Thermal pollution effect	14%
USA, a polluter	11%
Paper from trees	4%

The above table begins with the least known problem or question in the Part B Scale; i.e., 82% of the 271 responding teachers were not able to correctly choose the appropriate answer from a set of four given choices.

Item analyses indicate some areas of concern. Most teachers grossly (82%) underestimated the rate at which Indiana residents co.sume fossil fuels, compared to the average rate of fuel use in the world. Over half expect nuclear plants to produce most US energy by 1990, and over half assume that 55 miles per hour is the most efficient speed for good gas mileage.

A number of unusual answers were selected by teachers. Twenty-six percent label a dictionary definition of *ecology* as *environment*. Twenty-two percent say that almost all energy used on earth comes from *water*, and fifteen percent choose *waterfalls and rivers* as the principal source of Indiana electricity. Twenty-four percent select *snow in Ohio* as a principal supplier of Wabash river water. Sixteen percent choose a *plastic bottle* as fast decaying and another sixteen percent name *beef* as close to the sun in the food chain *(vs. beans)*. Fourteen percent of the teachers indicate that to *turn thermostats down at night* would be a poor way to save fuel.

Teachers Grade Themselves

Each respondent was asked to compare his/her knowledge about environmental problems with that of other teachers, and to give himself a "grade" on environmental knowledge and awareness. Results of self-grading indicate that most teachers do not consider themselves highly informed with respect to environmental problems (13% A's). However, they see themselves as knowing as much as other teachers (61%, "the same").

Table 6 gives an item breakdown for the two self-grading questions.

Table 6

SELF EVALUATION

REGARDING ENVIRONMENTAL AWARENESS

(Number and Percent of Teachers Responding, Per Category)

Item: "With regard to environmental problems and solutions, compared to other Indiana Teachers, I know."

More	Less	The Same	Nothing
55 (21%)	41 (16%)	160 (61%)	7 (3%)

Item: "On a scale of A, B, C, D, I give myself the following "grade" on knowledge and awareness" of environmental problems and solutions.

A	B	C	D
34 (13%)	132 (50%)	87 (33%)	11 (4%)

Items 95 and 96, Scale Part B, yielded the above information.

Results

Part C: Feelings and Attitudes about Environmentally Related Expressions

Teachers were asked to place check marks upon each segmented scale that spanned selected word pairs like Good _____:_____:_____:_____:_____:_____:_____: Bad relating their feelings about each of twelve given environmentally-related expressions. Part C was designed to yield factors for semantic differential analysis by the Indiana State Department of Public Instruction. For the purpose of this study, two scales were utilized for each of the twelve expressions: *good-bad,* and *wise-foolish.* (See Appendix for instrument) Each scale contained seven identifiable segments, with the middle segment identified as neutral.

The current analysis of results is based upon the assignment of linear directional values -3 -2 -1 0 +1 +2 +3, with a maximum positive total of +6 possible when combining values from two scales.

Table 7

Teacher Attitudes Toward Selected Environmental Expressions

(N = 259)

	Environmental Expression	Mean
1.	Clean Environment	+5.31
2.	Treated Sewage	+5.07
3.	Birth Control	+4.50
4.	Technology	+4.15
5.	Nuclear Energy	+3.55
6.	Emmission Control	+3.38
7.	Electric Heating	+2.78
8.	Auto Weight Tax	+1.15
9.	Industrial Water Use	+0.38
10.	Agricultural Pesticide	+0.35
11.	Factory Effluent	-1.36
12.	Strip Mine	-1.68

Table 7 indicates that Indiana teachers strongly support a clean environment as both "wise" and "good," while they have somewhat negative feelings about strip mines.

Summary

The analyses of results of this study yield a partial profile of Indiana teachers' knowledge and attitudes about environmental problems and their proposed solutions.

As expected, science teachers appear to be relatively informed with respect to the physical environment. However the general level of environmental knowledge and awareness on the part of Indiana teachers is inadequate, as indicated by the results of each part of the study.

Many environmental vocabulary terms that appear daily in the media are admittedly unknown to one-fourth or more of all teachers. (e.g., *biodegradable, fossil fuel, greenhouse effect, hydrocarbon, ozone,* and *reclamation.*) It is unlikely that teachers who lack environmental literacy can effectively perform as environmental teachers.

Some basic environmental relationships appear not to be known by teachers. When most teachers fail to recognize the general location of the Wabash River watershed, one may possibly attribute this to unfamiliarity with geography. When most show an apparent overfaith in near-future non-fossil energy suppliers, lack of information or wishful thinking may be the case. Possibly more dramatic is the fact that one teacher in seven believes that Indiana gets most of its electrical energy from

waterfalls and rivers. It is apparent through these and previously noted examples that significant environmental misconceptions exist.

Teachers indicate that they want a clean environment. As a group they are pro-technology, favoring the treatment of sewage, emission control, and nuclear energy. They tend to firmly endorse birth control. Although they support electric heating, they consider strip mines to be rather bad and/or foolish; perhaps some fail to see the existence of the positive correlation between strip mines and electric heating.

From this study, one may suggest that as a group Indiana teachers are inadequately informed about their physical environment, if they are to effectively help young people to face growing environmental problems.

Conclusion and Implications

All Indiana teachers should be well informed about their physical environment, since each teacher is in some way entrusted with informing students and implanting appropriate and constructive attitudes toward the finite and interrelated environmental factors of spaceship earth. Science teachers, who deal with most formal environmental content in school curricula, are better informed than their colleagues from social studies and other disciplines.

The current rate of environmental, technological, and social change presents a complicated challenge to teachers who wish to become well informed. In addition, school environmental education emphases swing upon a curricular pendulum, at times being associated with a pollution of environmental information and educational material.

As a result of this study, it is suggested that with respect to environmental education,

1.) Indiana teachers need help.

2.) A statewide educational delivery system should be utilized, possibly including a cooperative effort by the Indiana Higher Education Television Service (IHETS), one or more State Universities, and the State Department of Public Instruction.

3.) Local school science teachers can serve as peer teachers about the environment, since they are relatively well informed.

4.) A cost-effective environmental education update should be conducted with Indiana teachers, focusing upon key environmental issues, vocabulary development, and the removal of misconceptions.

This study reveals a problem: Indiana teachers need new environmental knowledge. The problem can be solved through extensive and cooperative efforts by existing agencies and personnel.

APPENDIX

STATE of INDIANA

Dr. Harold H. Negley Superintendent
STATE DEPARTMENT OF PUBLIC INSTRUCTION
ROOM 229 - STATE HOUSE
AREA CODE 317-633-6610

INDIANAPOLIS 46204

MEMORANDUM

TO: Elementary and Secondary Educators

FROM: Harold H. Negley, Superintendent
State Department of Public Instruction

DATE: December 6, 1974

RE: Environmental Education

You have been selected by this office to participate in a research project which will assist Indiana State University and the Indiana Department of Public Instruction in determining the knowledge and attitudes Hoosier teachers have toward the environment. Results from this research project will play an important part in the design of future pre-service and in-service programs for Hoosier educators.

Your cooperation is needed to make this important endeavor a success. If you would complete parts A, B, and C in alphabetical order and return your data to Indiana State University this week, I will appreciate this very much.

Thank you for taking time from a busy teaching schedule to participate in this most important project. If you write your name and address on the enclosed post card, you will be mailed a summary of this research project as soon as it is completed.

HHN/mjw

Part A: ENVIRONMENTAL TERMS:

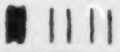
Directions: For each of the 70 terms listed below, indicate your present degree of understanding in relation to your physical environment. On the separate answer sheet, shade in the space below the letter which corresponds to the BEST answer.

A. I know what the term means.
B. I recognize the term, but I don't know what it means.
or C. I have never heard of the term.

E.G./ "Energy" (I know that energy is the capacity to do work),

therefore,

A B C



1. additives
2. aeration
3. algae
4. atmosphere
5. biodegradable
6. biosphere
7. bituminous
8. cloud seeding
9. compost
10. conservation
11. DDT
12. decibel
13. degasification
14. detergent
15. ecology
16. effluent
17. emission
18. environment
19. enzyme
20. EPA
21. ERTS
22. exhaust
23. fly ash
24. food chain
25. forestry
26. fossil fuel
27. greenhouse effect
28. herbicide
29. hydrocarbon
30. incinerator
31. leaching
32. leaded (gasoline)
33. legal
34. litter
35. mercury
36. navigable
37. nuclear energy
38. organic
39. organism
40. overpopulation
41. ozone
42. particulate
43. pesticide
44. phosphate
45. plankton
46. pollution
47. precipitator
48. raw sewage
49. reclamation
50. recycle
51. refuse
52. reservoir
53. runoff
54. rural
55. scrubber
56. smog
57. solar
58. sonic boom
59. standard
60. strip mine
61. sulfur dioxide
62. SST
63. technology
64. temperature inversion
65. thermal
66. toxic
67. urban
68. water rights
69. watershed
70. wilderness

PART B: ENVIRONMENTAL PROBLEMS AND CONCEPTS

Directions: Continuing with your separate answer sheet, mark the letter that corresponds to the BEST answer in each case.

71. Air pollution in my city or the closest city comes mainly from

A. factories
B. homes
C. cars
D. other sources

72. The greatest amounts of electricity are used in homes between

A. 8:00 and 10:00 A.M.
B. noon and 2:00 P.M.
C. 3:00 P.M. and 5:00 P.M.
D. 5:00 P.M. and 7:00 P.M.

73. The first one of these to decay when buried in the ground is a (an)

A. glass bottle
B. "tin" can
C. aluminum can
D. plastic bottle

74. Which of these activities would help most to reduce pollution?

A. Adults should ride bikes.
B. Children should eat natural foods.
C. Dogs should be kept on leashes.
D. Clothing should be washed with soaps instead of detergents.

75. The paper on which this test is written was made from

A. animals
B. oil
C. trees
D. air

76. The study of living things and the way they live in their surroundings is called

A. environment
B. ecology
D. geometry
E. geography

77. The worst polluters are the people who live in (the)

A. Saudi Arabia
B. China
C. India
D. United States.

78. Most electricity used in Indiana comes from

A. burning fuels
B. waterfalls and rivers
C. atomic power plants
D. chemical batteries

79. Almost all the energy we use on the earth comes from (the)

A. water
B. sun
C. atmosphere
D. dirt

80. To kill a weed, it is usually best to

A. spray it with 2-4-D
B. poison it
C. water it
D. pull it

81. A person can destroy part of his hearing by often

A. listening to loud music
B. driving large tractors
C. doing either of these
D. neither of these

82. Much water that runs down the Wabash River comes from

A. rain in Illinois
B. rain in Kentucky
C. snow in Ohio
D. snow in Michigan

83. How much garbage, organic and inorganic, does the average U.S. citizen produce at his home in a day?

A. less than a pound
B. 1-2 pounds
C. 3-4 pounds
D. more than four pounds

84. Of these, the poorest way to save fuel in homes is to

A. use fireplaces
B. use gas heat
C. turn thermostats down nights
D. insulate homes

85. "Hard" water contains compounds of

A. nitrogen and hydrogen
B. hydrogen and sulfur
C. sulfur and calcium
D. calcium and magnesium

86. On the average we use, in the home, approximately the following total amount of water per person each day

A. 2 gallons
B. 20 gallons
C. 200 gallons
D. 2000 gallons

87. Closest to the sun in the "food chain" is the protein in

A. beef
B. eggs
C. beans
D. cheese

88. Mercury pollution in lakes and streams

A. makes the water so cloudy that fish can't see
B. gets into fish, making them unsafe to eat
C. makes fish grow too quickly and too large
D. kills all the fish

89. If a factory or power plant dumps large amounts of hot water into a stream,

A. germs will be killed, making the water safer
B. the amount of sediment carried by the stream will increase
C. less water will evaporate
D. fish may be killed or kept from spawning

90. The people of Indiana (approximately 1/2000 of the world's population) use approximately the following fraction of the world's fuels:

A. 1/2000
B. 1/1000
C. 1/500
D. 1/100

91. Of these auto speeds, the most efficient for gas mileage is

A. 10 miles per hour
B. 35 miles per hour
C. 55 miles per hour
D. 70 miles per hour

92. Of these sources of energy, the principal U.S. supplier in the year 1990 will be

A. nuclear plants
B. solar space stations
C. geothermal heat pumps
D. petroleum

93. Of these, the largest fossil fuel reserves on earth are found in

A. coal
B. peat
C. petroleum
D. natural gas

94. Shale oil recovery is most closely related to problems of environmental management in (the)

A. off-shore Gulf of Mexico
B. Colorado mountains
C. Alaskan tundra
D. North Atlantic Ocean

95. With regard to environmental problems and solutions, compared to other Indiana teachers, I know

A. more
B. less
C. the same
D. nothing

96. On a scale of A, B, C, --, I give myself the following "grade" on knowledge and awareness of environmental problems and solutions

©
Dr. Chris Buethe
Indiana State University

Please circle the appropriate responses that describe you:

Elementary	Secondary	Age: 20-29
Male	Female	30-39
Urban	Rural	40-49
Married	Unmarried	50 +

Discipline: Science Soc. Studies Other

Part C

INDIANA ENVIRONMENT

The purpose of this scale is to measure your feelings and attitudes about environmental concepts. This information will help to determine the extent of teacher awareness about environmental problems in Indiana.

HOW TO COMPLETE THE SCALE

In completing this instrument, make your judgments on the basis of what these environmental expressions mean to you. The direction toward which you check, of course, depends upon which of the two ends of the scale seem most characteristic of the expression you are judging. Make each item a separate and independent judgment. Work at a fairly high speed for it is your first impressions, the immediate "feelings" about the items, that we want. On the other hand, please do not be careless because we want your true impressions. Complete each section in the order presented.

Examples:

If you feel that the environmental expression at the top of each section is very closely related to one or the other end of the scale, you might check as follows:

Good ✓ : : : : : : Bad

If you feel that the environmental expression is quite closely related to one or the other end of the scale (but not extremely), you might check as follows:

Beautiful : : : : : ✓ : Ugly

If the environmental expression seems only slightly related to one or the other side (but is not really neutral), then you might check as follows:

Active : : ✓ : : : : Passive

If you consider the environmental expression to be neutral on the scale, i.e., both sides of the scale are equally associated with the expression, or if the scale is completely irrelevant, (unrelated to the expression), then you should place your check in the middle space:

Difficult : : : ✓ : : : Easy

*This scale is based on the model developed by Snider and Osgood in Semantic Differential Technique, Chicago, Illinois: Aldine Publishing Company, 1969.

IMPORTANT: (1) Place your check-marks in the middle of spaces, not on the boundaries.

(2) Be sure you check every scale for each environmental expression-do not omit any.

(3) Never put more than one check-mark on a single scale.

CLEAN ENVIRONMENT

Wise	_____:_____:_____:_____:_____:_____:_____	Foolish
Unintentional	_____:_____:_____:_____:_____:_____:_____	Intentional
Domineering	_____:_____:_____:_____:_____:_____:_____	Lax
Easy	_____:_____:_____:_____:_____:_____:_____	Difficult
Beautiful	_____:_____:_____:_____:_____:_____:_____	Ugly
Passive	_____:_____:_____:_____:_____:_____:_____	Active
Potent	_____:_____:_____:_____:_____:_____:_____	Impotent
Bad	_____:_____:_____:_____:_____:_____:_____	Good
Serious	_____:_____:_____:_____:_____:_____:_____	Humorous

TREATED SEWAGE

Wise	_____:_____:_____:_____:_____:_____:_____	Foolish
Unintentional	_____:_____:_____:_____:_____:_____:_____	Intentional
Domineering	_____:_____:_____:_____:_____:_____:_____	Lax
Easy	_____:_____:_____:_____:_____:_____:_____	Difficult
Beautiful	_____:_____:_____:_____:_____:_____:_____	Ugly
Passive	_____:_____:_____:_____:_____:_____:_____	Active
Potent	_____:_____:_____:_____:_____:_____:_____	Impotent
Bad	_____:_____:_____:_____:_____:_____:_____	Good
Serious	_____:_____:_____:_____:_____:_____:_____	Humorous

ELECTRIC HEATING

Wise	_____	_____	_____	_____	_____	_____	_____ Foolish
Unintentional	_____	_____	_____	_____	_____	_____	_____ Intentional
Domineering	_____	_____	_____	_____	_____	_____	_____ Lax
Easy	_____	_____	_____	_____	_____	_____	_____ Difficult
Beautiful	_____	_____	_____	_____	_____	_____	_____ Ugly
Passive	_____	_____	_____	_____	_____	_____	_____ Active
Potent	_____	_____	_____	_____	_____	_____	_____ Impotent
Bad	_____	_____	_____	_____	_____	_____	_____ Good
Serious	_____	_____	_____	_____	_____	_____	_____ Humorous

TECHNOLOGY

Wise	_____	_____	_____	_____	_____	_____	_____ Foolish
Unintentional	_____	_____	_____	_____	_____	_____	_____ Intentional
Domineering	_____	_____	_____	_____	_____	_____	_____ Lax
Easy	_____	_____	_____	_____	_____	_____	_____ Difficulty
Beautiful	_____	_____	_____	_____	_____	_____	_____ Ugly
Passive	_____	_____	_____	_____	_____	_____	_____ Active
Potent	_____	_____	_____	_____	_____	_____	_____ Impotent
Bad	_____	_____	_____	_____	_____	_____	_____ Good
Serious	_____	_____	_____	_____	_____	_____	_____ Humorous

AUTO WEIGHT TAX

Wise	_____:_____:_____:_____:_____:_____:_____	Foolish
Unintentional	_____:_____:_____:_____:_____:_____:_____	Intentional
Domineering	_____:_____:_____:_____:_____:_____:_____	Lax
Easy	_____:_____:_____:_____:_____:_____:_____	Difficult
Beautiful	_____:_____:_____:_____:_____:_____:_____	Ugly
Passive	_____:_____:_____:_____:_____:_____:_____	Active
Potent	_____:_____:_____:_____:_____:_____:_____	Impotent
Bad	_____:_____:_____:_____:_____:_____:_____	Good
Serious	_____:_____:_____:_____:_____:_____:_____	Humorous

BIRTH CONTROL

Wise	_____:_____:_____:_____:_____:_____:_____	Foolish
Unintentional	_____:_____:_____:_____:_____:_____:_____	Intentional
Domineering	_____:_____:_____:_____:_____:_____:_____	Lax
Easy	_____:_____:_____:_____:_____:_____:_____	Difficult
Beautiful	_____:_____:_____:_____:_____:_____:_____	Ugly
Passive	_____:_____:_____:_____:_____:_____:_____	Active
Potent	_____:_____:_____:_____:_____:_____:_____	Impotent
Bad	_____:_____:_____:_____:_____:_____:_____	Good
Serious	_____:_____:_____:_____:_____:_____:_____	Humorous

NUCLEAR ENERGY

Wise	_____	_____	_____	_____	_____	_____	_____ Foolish
Unintentional	_____	_____	_____	_____	_____	_____	_____ Intentional
Domineering	_____	_____	_____	_____	_____	_____	_____ Lax
Easy	_____	_____	_____	_____	_____	_____	_____ Difficult
Beautiful	_____	_____	_____	_____	_____	_____	_____ Ugly
Passive	_____	_____	_____	_____	_____	_____	_____ Active
Potent	_____	_____	_____	_____	_____	_____	_____ Impotent
Bad	_____	_____	_____	_____	_____	_____	_____ Good
Serious	_____	_____	_____	_____	_____	_____	_____ Humorous

INDUSTRIAL WATER USE

Wise	_____	_____	_____	_____	_____	_____	_____ Foolish
Unintentional	_____	_____	_____	_____	_____	_____	_____ Intentional
Domineering	_____	_____	_____	_____	_____	_____	_____ Lax
Easy	_____	_____	_____	_____	_____	_____	_____ Difficult
Beautiful	_____	_____	_____	_____	_____	_____	_____ Ugly
Passive	_____	_____	_____	_____	_____	_____	_____ Active
Potent	_____	_____	_____	_____	_____	_____	_____ Impotent
Bad	_____	_____	_____	_____	_____	_____	_____ Good
Serious	_____	_____	_____	_____	_____	_____	_____ Humorous

STRIP MINE

Wise	_____	_____	_____	_____	_____	_____	_____ Foolish
Unintentional	_____	_____	_____	_____	_____	_____	_____ Intentional
Domineering	_____	_____	_____	_____	_____	_____	_____ Lax
Easy	_____	_____	_____	_____	_____	_____	_____ Difficult
Beautiful	_____	_____	_____	_____	_____	_____	_____ Ugly
Passive	_____	_____	_____	_____	_____	_____	_____ Active
Potent	_____	_____	_____	_____	_____	_____	_____ Impotent
Bad	_____	_____	_____	_____	_____	_____	_____ Good
Serious	_____	_____	_____	_____	_____	_____	_____ Humorous

EMISSION CONTROL

Wise	_____	_____	_____	_____	_____	_____	_____ Foolish
Unintentional	_____	_____	_____	_____	_____	_____	_____ Intentional
Domineering	_____	_____	_____	_____	_____	_____	_____ Lax
Easy	_____	_____	_____	_____	_____	_____	_____ Difficult
Beautiful	_____	_____	_____	_____	_____	_____	_____ Ugly
Passive	_____	_____	_____	_____	_____	_____	_____ Active
Potent	_____	_____	_____	_____	_____	_____	_____ Impotent
Bad	_____	_____	_____	_____	_____	_____	_____ Good
Serious	_____	_____	_____	_____	_____	_____	_____ Humorous

FACTORY EFFLUENT

Wise	_____:_____:_____:_____:_____:_____:_____	Foolish
Unintentional	_____:_____:_____:_____:_____:_____:_____	Intentional
Domineering	_____:_____:_____:_____:_____:_____:_____	Lax
Easy	_____:_____:_____:_____:_____:_____:_____	Difficult
Beautiful	_____:_____:_____:_____:_____:_____:_____	Ugly
Passive	_____:_____:_____:_____:_____:_____:_____	Active
Potent	_____:_____:_____:_____:_____:_____:_____	Impotent
Bad	_____:_____:_____:_____:_____:_____:_____	Good
Serious	_____:_____:_____:_____:_____:_____:_____	Humorous

AGRICULTURAL PESTICIDE

Wise	_____:_____:_____:_____:_____:_____:_____	Foolish
Unintentional	_____:_____:_____:_____:_____:_____:_____	Intentional
Domineering	_____:_____:_____:_____:_____:_____:_____	Lax
Easy	_____:_____:_____:_____:_____:_____:_____	Difficult
Beautiful	_____:_____:_____:_____:_____:_____:_____	Ugly
Passive	_____:_____:_____:_____:_____:_____:_____	Active
Potent	_____:_____:_____:_____:_____:_____:_____	Impotent
Bad	_____:_____:_____:_____:_____:_____:_____	Good
Serious	_____:_____:_____:_____:_____:_____:_____	Humorous